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10/657,360	09/08/2003	Michael Y. Wen	2000.110A	9508

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EXAMINER

DOUGLAS, JOHN CHRISTOPHER

ART UNIT PAPER NUMBER

1764

DATE MAILED: 04/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/657,360	<b>Applicant(s)</b> WEN, MICHAEL Y.	
	<b>Examiner</b> John C. Douglas	<b>Art Unit</b> 1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 September 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-41 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13-41 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-41 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/11/03 + 12/1/05</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-12, drawn to an apparatus, classified in class 422, subclass 189.
  - II. Claims 13-41, drawn to a process and product, classified in class 208, subclass 132.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the reactor can be used for the materially different process of reforming.
3. Because these inventions are independent or distinct for the reasons given above and have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.
4. During a telephone conversation with John F. Hunt on 3/24/06 a provisional election was made with traverse to prosecute the invention of Group II, claims 13-41. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-12 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claim 41 is rejected under 35 U.S.C. 102(b) as being anticipated by Khan (US 6059957). Khan discloses a stabilized light oil product (see Khan, column 6, lines 46-55).

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Art Unit: 1764

9. Claims 13-18, 20, 21, 25-27, and 34-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chahvekilian (US 3842138) in view of Khan (US 6059957) and Gomi (US 3689401).

10. With respect to claims 13-17, 24, 36, and 37 Chahvekilian discloses a process of thermally cracking a vaporized heavy distillate of crude oil at a temperature of between 625 and 1000 degrees C (1157 to 1832 degrees F) for 0.01 to 0.5 seconds in the presence of hydrogen and quenching the thermally cracked oil with a heavy oil immediately once it leaves the reactor (see Chahvekilian, column 1, lines 15-18, column 3, lines 33-47, column 4, lines 24-28 and lines 58-61, and column 8, lines 35-50).

Chahvekilian does not disclose where the heavy oil upgrading process stabilizes the quenched oil product at a temperature below 850 degrees F for 1-60 minutes to form a stabilized oil product and produces 95-wt% or greater liquid products.

However, Khan discloses upgrading heavy oil into lighter oil with a 0.97-wt% liquid product (see Khan, column 2, lines 40-42 and Table 6, where the liquid weight is 178.8 gm and the gas weight is 4.51 gm).

Khan discloses that it is preferred for gases derived from the upgrading process to be separated and recycled back into the process (see Khan, column 6, lines 38-46).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian to include upgrading heavy oil into lighter oil with a 0.97-wt% liquid product in order to recycle the gas back into the process.

Also, Gomi discloses stabilizing products from thermal cracking by subjecting the product to temperatures between 40 and 200 degrees C for 0.1 to 2 hours (104-392 degrees C for 6-120 minutes) (see Gomi, column 3, lines 10-30).

Gomi discloses that thermally unstable substances are converted into resins when heated and can cause plugging of pipes (see Gomi, column 3, lines 54-60).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian to include stabilizing products from thermal cracking by subjecting the product to temperatures between 40 and 200 degrees C for 0.1 to 2 hours in order to prevent the products from producing resins and plugging pipes.

11. With respect to claim 18, Chahvekilian also discloses where the quenched oil product is recycled as feed (see Chahvekilian, column 8, lines 15-19).

12. With respect to claims 20 and 21, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), but Chahvekilian does not disclose where at least 30 percent of the total upgrading of said heavy oil occurs in the stabilization step.

However, Gomi discloses a stabilizing step following thermal cracking that is performed under the same parameters as the claimed stabilization step (see Gomi, column 3, lines 20-25 and paragraph 8, above).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian to include where at least 30 percent of the total upgrading of said heavy oil occurs in the stabilization step

Art Unit: 1764

because both applicants invention and Gomi disclose thermal cracking followed by a stability step and the stability step of Gomi is operated under the same conditions as Gomi. Thus, the stability step of Gomi should produce similar products of the claimed invention, such as where at least 30 percent of the total upgrading of said heavy oil occurs in the stabilization step.

13. With respect to claim 25, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), but Chahvekilian does not disclose where the hydrogen containing gas is syngas produced primarily from air as an oxidizing agent, where the syngas contains hydrogen gas.

However, Khan discloses where the hydrogen containing gas is syngas produced from oxygen as the oxidizing agent, where the syngas contains hydrogen gas (see Khan, column 2, lines 5-7 and column 4, lines 4-8).

Khan discloses that syngas is obtained by a reaction in the process and is used to supply hydrogen to the reaction and that hydrogen not generated in the refinery must be preheated (see Khan, column 1, lines 57-67 and column 3, lines 59-65).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian to include where the hydrogen containing gas is syngas produced from oxygen as the oxidizing agent, where the syngas contains hydrogen gas in order to avoid preheating the hydrogen.

14. With respect to claim 26, Chahvekilian discloses where the thermal cracking step is conducted at a pressure between 5 and 70 bars (73-1015 psi) (see Chahvekilian, column 3, lines 45-47).

Art Unit: 1764

15. With respect to claim 27, Chahvekilian discloses where the thermal cracking step is conducted at a hydrogen gas partial pressure of 7.14 bar (103.6 psi) (see Chahvekilian, column 11, Table I and 7.14 bar is obtained by multiplying the percent hydrogen in the reactor of 34.4% by the reactor pressure of 21 bars).

16. With respect to claims 34 and 35, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), but Chahvekilian in view of Gomi and Khan do not disclose where the reaction severity index of the stabilizing step is below 200 seconds.

However, Gomi discloses a stabilizing step following thermal cracking that is performed under the same parameters as the claimed stabilization step (see Gomi, column 3, lines 20-25 and paragraph 8, above).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian in view of Khan and Gomi to include where the reaction severity index of the stabilizing step is below 200 seconds because both applicants invention and Gomi disclose thermal cracking followed by a stability step and the stability step of Gomi is operated under the same conditions as Gomi. Thus, the stability step of Gomi should be performed under similar conditions as Gomi, which would mean that the reaction severity index of the stabilizing step is below 200 seconds.

17. With respect to claim 38, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), and Chahvekilian discloses where thermal



Art Unit: 1764

cracking is conducted without a catalyst (see Chahvekilian, column 1, lines 55-57), but Chahvekilian does not disclose a stabilizing step.

However, Khan discloses a stabilizing step using an inert gas and does not disclose a catalyst in this step (see Khan, column 6, lines 47-55).

Khan discloses that the stabilizing step is used to remove dissolved gases (see Khan, column 6, lines 47-55).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian to include a stabilizing step using an inert gas and does not disclose the use of a catalyst in order to remove dissolved gases.

18. With respect to claim 39, Chahvekilian does not disclose the presence of solids in the feed oil and the feed oil contains less than 1% of residue (see Chahvekilian, column 12, Table IV).

19. With respect to claim 40, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), and Chahvekilian discloses where the product stream is fractionated and the heavy oil fraction is recycled to the thermal cracking step (see Chahvekilian, column 8, lines 32-35 and Figure 1).

20. Claims 22, 23, 32, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chahvekilian in view of Khan and Gomi as applied to claim 16 above, and further in view of Gregoli (US 6016868).

Art Unit: 1764

21. With respect to claims 22 and 23, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), but do not disclose where the process produces less than 1 wt% of C1 to C4 hydrocarbons.

However, Gregoli discloses a product containing 1.12 wt% of C1-C4 hydrocarbons (see Gregoli, column 26, Table 10 and MPEP §2144.05).

Gregoli discloses that the hydrocarbon gases are removed from the processed oil before the product oil is obtained (see Gregoli, column 13, lines 1-30).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian in view of Khan and Gomi to include a product containing 1.12 wt% of C1-C4 hydrocarbons because most of the C1-C4 hydrocarbons are removed from the product oil as a gas.

22. With respect to claims 32 and 33, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), but do not disclose where the process produces 1050 degrees F conversion of greater than 35-wt%.

However, Gregoli discloses a process that produces a 975 degree F conversion of 50% (see Gregoli, column 22, Table 6 and MPEP §2144.05).

Gregoli discloses that increased hydrogen improves product quality (see Gregoli, column 23, lines 26-28).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian in view of Khan and Gomi to include a process that produces a 975 degree F conversion of 50% so that the product produced is of an improved quality.

Art Unit: 1764

23. Claims 19 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chahvekilian in view of Khan and Gomi as applied to claim 16 above, and further in view of Benham (US 6004453).

24. With respect to claim 19, Chahvekilian in view of Khan and Gomi disclose everything in claim 18 (see paragraph 9), but do not disclose where the total mass flow rate of feed oil provided to the thermal cracking step is at least 10 times greater than the first flow rate of the fresh feed stream.

However, Benham discloses that the product yields of distillate increase as the % of gas recycle increases (see Benham, Figure 7).

Benham discloses that recycling heavy gas oil to the reactor allows for increased reaction temperatures without coke formation (see Benham, column 5, lines 20-25).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian in view of Khan and Gomi to include where the thermal cracking step is at least 10 times greater than the first flow rate of the fresh feed stream because product yields improve as the recycle rate increases and recycling heavy gas oil to the reactor allows for increased reaction temperatures without coke formation.

25. With respect to claims 29-31, Chahvekilian in view of Khan and Gomi disclose everything in claim 16 (see paragraph 8), but do not disclose where the process produces less than 0.1 wt% of coke on a fresh feed oil basis.

However, Benham discloses a process that produces no coke (see Benham, column 4, lines 36-41).

Benham discloses that coke formation can create a problem of limiting reactor temperatures (see Benham, column 5, lines 1-9).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian in view of Khan and Gomi to include a process that produces no coke in order to prevent reactor temperatures from being limited.

26. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chahvekilian in view of Khan and Gomi as applied to claim 27 above, and further in view of Fuderer (US 4822521). Chahvekilian in view of Khan and Gomi disclose everything in claim 27 (see paragraph 13), but do not disclose where the steam to hydrocarbon ratio used to produce syngas is from 0.5:1 to 2.0:1.

However, Fuderer discloses producing synthesis gas with a steam to hydrocarbon ratio of 2:1 (see Fuderer, column 2, lines 13-15 and column 1, lines 26-29).

Fuderer discloses that conventional steam reforming is conducted with a steam to hydrocarbon ratio of 2:1 (see Fuderer, column 1, lines 26-29).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of Chahvekilian in view of Khan and Gomi to include producing synthesis gas with a steam to hydrocarbon ratio of 2:1 because it is conventional to use such a ratio in steam reforming.

### ***Double Patenting***

27. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the

Art Unit: 1764

unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

28. Claims 1 and 16 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6852215 in view of Gomi. Claim 1 discloses treating a heavy oil with hydrogen gas at a temperature above about 1200 degrees F for less than 10 seconds to form an upgraded oil, quenching the upgraded heavy oil with an unreacted heavy oil, and stabilizing the mixture of the upgraded heavy oil and unreacted heavy oil for a residence time of from 1 to 60 minutes to form an upgraded oil mixture. The term treating includes thermal cracking because it is performed under the same conditions as thermal cracking. Also, 1225 degrees F is in the range of above about 1200 degrees F. Claim 1 does not disclose that the quenched oil product is stabilized below 850 degrees F. However, Gomi discloses stabilizing products from thermal cracking by subjecting the product to temperatures between 40 and 200 degrees C (104-392 degrees C) (see Gomi, column

Art Unit: 1764

3, lines 10-30). Gomi discloses that thermally unstable substances are converted into resins when heated and can cause plugging of pipes (see Gomi, column 3, lines 54-60). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of claim 1 to include stabilizing products from thermal cracking by subjecting the product to temperatures between 40 and 200 degrees C in order to prevent the products from producing resins and plugging pipes.

29. Claim 15 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 4 of U.S. Patent No. 6852215. Although the conflicting claims are not identical, they are not patentably distinct from each other because claim 4 discloses that the heavy oil upgrade reaction is predominantly a gas phase reaction.

30. Claims 25 and 28 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 2, 5, and 6 of U.S. Patent No. 6852215 in view of Fuderer. Claims 2, 5, and 6 disclose that the hydrogen-containing gas is produced by igniting compressed air as an oxidizing agent with a hydrogen-containing fuel, with the fuel being a mixture of natural gas and steam. Claims 2, 5, and 6, do not disclose a steam to hydrocarbon gas molar ratio being from 0.5:1 to 2.0:1. However, Fuderer discloses producing synthesis gas with a steam to hydrocarbon ratio of 2:1 (see Fuderer, column 2, lines 13-15 and column 1, lines 26-29). Fuderer discloses that conventional steam reforming is conducted with a steam to hydrocarbon ratio of 2:1 (see Fuderer, column 1, lines 26-29). Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the process of

Art Unit: 1764

claims 2, 5, and 6 to include producing synthesis gas with a steam to hydrocarbon ratio of 2:1 because it is conventional to use such a ratio in steam reforming.

### ***Conclusion***

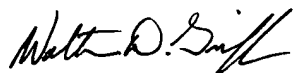
31. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Busch (US 4569753).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John C. Douglas whose telephone number is 571-272-1087. The examiner can normally be reached on 7:30 A.M. to 4:30 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JCD

  
**Walter D. Griffin**  
**Primary Examiner**